<u>RULES AND REGULATIONS</u>

<u>PERTAINING TO</u>

<u>DRIP DISPERSAL SYSTEMS</u>

<u>ACT 402 OF 1977</u>

<u>A.C.A. 14-236-101 et seq.</u>

<u>Draft</u>

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Section 1. Authority and Purpose

1.1. The following RULES AND REGULATIONS PERTAINING TO DRIP DISPERSAL SYSTEMS are duly adopted and promulgated by the Arkansas State Board of Health pursuant to the authority expressly conferred by the laws of the State of Arkansas including, without limitation, Act 96 of 1913 (A.C.A {20-7-109}, and Act 402 of 1977 (A.C.A. {14-236-101}. et seq.).

~~Section 1.~~1.2. Purpose: A drip dispersal system is a technology for the distribution of treated wastewater uniformly over a large area beneath the soil surface. Drip Dispersal fields are a "bed" design. The use of four (4) to six (6) inch installation cover does not fit the conventional trench design criteria utilized in the Onsite Wastewater Soil Morphology Program for system design.

Section 2. Definitions

2.1. **Aerobic treatment unit (ATU):** A mechanical on-site treatment unit that provides secondary wastewater treatment by mixing air and aerobic and facultative microbes with the wastewater. ATU's typically use a suspended growth treatment process or a fixed treatment process.

2.2. **Air/vacuum (A/V) relief valve:** A valve that automatically lets air out of or into liquid carrying pipe as needed in response to changes in system pressure.

2.3. **Aerobic:** Having molecular oxygen as a part of the environment, or growing or occurring only in the presence of molecular oxygen.

2.4. **Backwash:** The process of flow reversal to clean a filter and to restore it to the normal clean condition for filtering with a minimum resistance to flow through the media or screen.

2.5. **Control panel:** An electronic control panel that controls the quantity and time of dose. This can also control the zone receiving the effluent, automatically flushes the lines, flushes the filters, monitors the flow rates and pump run cycles or times.

2.6. **Decentralized system:** An onsite and/or cluster wastewater system used to treat and disperse or discharge small volumes of wastewater, generally from dwellings or businesses that are located relatively close together.

2.7. **Disk filter:** A type of filter that utilizes a series of grooved rings that overlay each other to from a network of very small openings to trap contaminants.

2.8. **Distributing valve:** A valve that distributes flow to multiple drain field laterals, zones, or locations by automatically rotating upon each pump cycle.

2.9. **Drain-back:** The process of effluent draining along the laterals and manifolds after the pump shuts off. Drainage occurs both inside and outside the drip tubing and manifolds to lower elevations in the drip field.

2.10. **Drip line:** Tubing constructed from polyethylene with emitters embedded regularly along the length of the tube.

2.11. **Effluent:** Sewage, water or other liquids, partially or completely treated or in its natural state flowing out of a septic tank, aerobic treatment unit, or other treatment system or systems.

2.12. **Emitters:** Small diameter openings in drip line that can dissipate pressure and allow a slow, controlled discharge normally rated in gallons per hour.

2.13. **Field flush:** Water is passed through the drip lateral for the purpose of removing particles and other debris from the walls of the drip tubing. The flush water is carried back through the return manifold and return line to the pretreatment unit.

2.14. **Filter:** A device for the main purpose of removing suspended solids and other debris from the wastewater.

2.15. **Hydraulic conductivity:** The rate of water movement under unit gradient in a specific soil horizon.

2.16. **Interceptor Drain:** A subsurface drain line, usually constructed upgrade from the absorption area to divert seasonal groundwater.

2.17. **Lateral**: One single run or multiple runs of drip tubing connected at one end to a supply manifold and the other end connected to a return manifold.

2.18. **Maintenance Personnel:** An individual certified by the Department to conduct assessments under the Onsite Maintenance and Monitoring Program.

2.19. **Monitoring:** Periodic inspection of system for performance.

2.20. **Pressure compensating (pc) emitters:** Drip emitters that allow a constant flow or discharge over a wide range of applied pressure.

2.21. **Pressure distribution:** A system of small diameter pipes equally distributing effluent through a trench or bed.

2.22. **Pressure regulator:** A device used to regulate and maintain a constant discharge pressure.

2.23. **Pretreatment:** The conditioning of effluent prior to dispersal by a drip system.

2.24. **Return line:** The return line connects the return manifold to the pretreatment unit for the purpose of carrying flush water from the drip field.

2.25. **Return manifold**: A collection manifold or piping that returns excessive wastewater and debris to the primary treatment tank during system flushes.

2.26. **Run:** One continuous length of tubing routed across contour connected to a supply line or return line or another run.

2.27. **Soil structure:** The combination or arrangement of individual soil particles in definable aggregates, or peds, which are characterized and classified on the basis of size, shape, and degree of distinctness.

2.28. **Solenoid valve**: An electric valve actuated by a solenoid, used for controlling the flow of liquid in pipes.

2.29. **Spin filter**: A filter that consist of a screen cylinder enclose in a casing. The typical filter screen mesh size is 150 and a micron rating of 100.

2.30. **Static plow:** A drip line plow with a shank that remains at a given depth as the plow is pulled through the soil.

2.31. **Supply line:** The line that extends from the pump to the supply manifold of a given zone.

2.32. **Supply manifold:** The supply manifold connects the supply line to the drip laterals.

2.33. **Vertical separation:** The depth of unsaturated, original, undisturbed soil between the bottom of the drip tubing and the highest seasonal water table or restrictive layer.

2.34. **Vibratory plow:** A vibratory plow is a drip line plow with a shank that vibrates vertically as the plow is pulled through the soil.

2.35. **Water table:** The level in saturated soil at which the hydraulic pressure is zero.

~~2.1.~~2.36. **Zone:** A group of laterals that are dosed at the same time.

Section 3. Site Assessment

3.1. Subsurface Drip System(s) may be utilized on sites that meet the following criteria

3.1.1. The minimum vertical separation between the drip tubing or installed trench bottom and any rock substrata (consolidated or fractured) shall be nine (9) inches or greater of undisturbed, natural soil.

3.1.2. The drip tubing or installed trench bottom shall be above the seasonal water table, whatever the duration. Brief seasonal water tables may be minimized or eliminated by the use of effective interceptor drains. Any design, which incorporates the use of an interceptor drain, shall indicate the effective depth of seasonal water table reduction.

3.1.3. The percent clay of a soil may be interpreted as a Seasonal Water Table Class. Clay percentage, as it relates to seasonal water table interpretation, is sited in Section 8 of the Onsite Wastewater Regulations.

3.1.4. Soils that are structure less or with massive structure shall not be approved for onsite sub-surface treatment.

~~3.1.1.~~3.1.5. The lot size shall be of sufficient area to accommodate both the primary and secondary dispersal area. Both the primary and secondary dispersal area shall be sized according to their respective loading rates. If the lot can only support the primary dispersal field, a subsurface drip dispersal system shall not be installed. For lots three (3) acres or greater, the use of a surface discharge drip system may be considered. (See Surface Discharge Systems)

Section 4. Drip Tubing and Emitters

4.1. Emitter spacing can range from six (6) to twenty-four (24) inches. The emitters used in the tubing shall be pressure compensating. Pressure compensating emitters have a relatively constant discharge rate over a wide range of pressures. Emitter flow rate shall be specified by the designer and stated on the system plans. The drip line pressure can range from 5 to 70 pounds per square inch (PSI).

4.2. Drip tubing shall be installed by one the following methods: static plow, chain trencher or vibratory plow.

4.3. Static plow is the preferred method for inserting drip tubing into the soil. The static plow shall be pulled not pushed through the soil.

4.4. Chain trencher may be used for placement of the drip tubing in the soil. The maximum chain trench width is four (4) inches.

4.5. Wet soil shall not be plowed because of smearing.

~~4.1.~~4.6. Drip tubing installed in natural soil shall be installed to a depth of six (6) inches.

~~4.2.~~4.7. If capping fill material is used as part or all of the cover over the tubing, the installed depth of the tubing can range from one (1) to five (5) inches in the natural soil. Drip tubing shall not be placed in the capping fill material. In no case shall the cover over the tubing be less than six (6) inches.

~~4.3.~~4.8. Settled depth of the cap shall not be more that 8 inches. The capping fill material shall not contain more than 27 % clay or 60% sand or 70% silt. Before the capping fill material is delivered to the proposed dispersal site, a textural analysis shall be provided. A credit of up to 50% of the settled cap depth may be allowed in the adjustment of the seasonal water table. This seasonal water table credit is at the sole discretion of the Department.

Section 5. Pretreatment Requirements

5.1. The quality of effluent that will be applied to the dispersal field shall meet the American National Standards Institute/National Sanitation Foundation (ANSI/NSF) Standard 40 (revised 2005) requirements for class 1 treatment systems. Only pretreatment units that have obtained approval from the Department shall be used.

~~5.1.~~5.2. Pretreatment system shall be required as part of any Drip Dispersal System design.

~~5.2.~~5.3. The daily flow rate capacity of a pretreatment system shall equal or exceed the daily flow rates found in Appendix A.

~~5.3.~~5.4. Pretreatment systems installed in conjunction with an individual residential structure shall have a daily flow rate capacity of not less than 400 gallon per day.

~~5.4.~~5.5. Pretreatment systems installation on non- residential or multi-structures shall be sized according to influent wastewater strength and total daily flow rate expressed in gallons per day.

~~1.1.Tthe use of four (4) to six (6) inch installation depth does not fit the conventional trench design criteria utilized in the Onsite Wastewater Soil Morphology Program for system design.~~

~~1.2.~~

~~1.3.A very small volume of wastewater is dosed into the soil at predetermined time intervals throughout the day. A drip dispersal system (DDS) consists of a network of~~

pressurized piping tubing????? whereby uniform distribution over the entire footprint of the dispersal area can be achieved. The objective of a drip dispersal system is to minimize soil saturation while at the same time achieving equal distribution. A drip dispersal system lessens any remaining pollutants, provides for the dispersal of the wastewater through the soil, and allows plant uptake of the wastewater through their root system. This is achieved by the use of several key components all working together as an integrated system rather than individual components. A failure of one component can result in the failure of the entire system. A through understanding of each component and how it affects the overall operation of the system is critical to the long-term success of a drip dispersal system.

WHY DO WE SPEND SO MUCH TIME HERE TALKING ABOUT BEDS AND TUBING AND NOT OVERALL SYSTEM DESIGN AND COMPONENTS IF ALL ARE CRITICAL TO SYSTEM FUNCTIONALITY

1.4.The basic components and/or materials that typically made up a system include:

1.4.1.Drip line Tubing / Tubing with emitters
1.4.2.Pumps
1.4.3.Filters
1.4.4.Flow meter and pressure gauges
1.4.5.Control system
1.4.6.Supply line and manifold
1.4.7.Return line and manifold
1.4.8.Flexible PVC tubing
1.4.9.Air/Vacuum release valves
1.4.10.Flush valves
1.4.11.Specialty Connectors and fittings
1.4.12.Valve boxes
1.4.13.Pressure regulators
1.4.14.Zone valves
1.4.15.Check valves

Section 3.Drip Tubing and Emitters

4.1.The tubing used in a DDS is constructed from a flexible polyethylene material, which is DOES OUR APPROVED PRODUCT HAVE CERTAIN SPECS ON DIAMETER AND EMITTER SPACING??? available in several pipe diameters with 1/2 inch (in) as the typical size for wastewater applications. Drip emitters are placed equally along the tubing at various intervals with 24 inch spacing as the most common. The emitters used in the tubing shall be pressure compensating. Pressure compensating emitters have a relatively constant discharge rate over a wide range of pressures. The drip line pressure can range from 5 to 70 pounds per square inch (PSI). The preferred drip line pressure for a system is 15-45 PSI. A steady flow rate over a wide range of pressures simplifies the design of the dispersal fields when installed on sites with steep slopes or rolling terrain. Higher pressures provide for longer laterals since lower pressures at the end of the laterals do not affect the discharge rate at each emitter.

3.2.The laterals in a drip dispersal field shall be equal in length as possible. In order to avoid unequal length laterals, the use of flexible PVC tubing to connect each run is preferred. Limitingreducing; static plow, chain trencher or vibratory plow. The choice of installation method depends on several factors such as soil structure, the amount of surface and subsurface rock and the slope of the site. Using a wrong an unsuitable installation method can result in damage to the drip tubing as well as damage to the installation equipment.

3.3.2.4a.Static plow is the preferred method for inserting the drip tubing into the soil. Each shank or knife of a static plow shall be equipped with a coulter for cutting the sod. The coulter allows the shank or knife to slice through the soil without uprooting the sod so as to limit disruption of the site. In order to maintain a consistent tubing depth, the plow shall be equipped with gauge wheels. The static plow shall be pulled not pushed through the soil. If necessary, assist weights may be added to the plow to help stabilize the insertion depth. SHOULD THERE BE SOME SPECIFICATION ABOUT TIRES VERSUS TRACK DRIVEN EQUIPMENT???

3.4.2.4bChain trencher may be used for placement of the drip tubing in the soil. The maximum chain trench width is four (4) inches. Since chain trencher deposit the soil from the trench to the side of the trencher, the drip tubing should be placed in the each trench before the next trench is cut. This way the soil from the next trench will back fill the previous trench containing the newly installed drip tubing.IS THERE A TWO FOOT SPRAY OF THE SOIL SO IT WILL LAND IN THE TRENCH??? IS THERE OTHER NEEDED WORK LIKE RAKING, LEVELING, ETC? Since the structure of the back fill has been changed, additional fill material may have to be brought to the site. It is a good practice to mark the path that the chain trencher will travel. Marking allows the trencher operator to maintain even spacing between each lateral as well stay on contour.

3.5.2.4cVibratory plows use an oscillating shank or knife that vibrates vertically as it travels through the soil. The vibratory plow has the ability to plow through difficult soil conditions such as rocky soils, tree roots or dry hard soils. Since the shank or knife vibrates, care must be used to prevent damaging the tubing as it is inserted into the soil. Wet soils do pose a problem with this type of plow since the vibrating shank or knife can lead to sealing along the trench wall.

3.6.Regardless of the insertion method, certain installation practices should be followed for long-term success of the drip tubing. The polyethylene tubing will stretch if pulled. It is very important that the tubing feed into the plow or trencher with little or no resistance. The tubing reel shall hold the tubing secure but at the same time allow free movement of the tubing into the shank or knife.

3.7.Wet soil shall not be plowed because of smearing; however soil that is dry can be a problem. Very dry soil conditions may require the use of a sprinkler system for increasing the moisture content of a soil prior to the insertion of the tubing. This is an acceptable installation practice. Soils that have sufficient moisture will allow the plow shank or knife to slice through the soil with minimum disturbance of the soil structure. Also, soils that are too wet do not offer adequate traction for the static or vibratory plows. The loss of traction can cause the traction wheels to spin. This spinning of the traction wheel can cause over compaction of the soil around the tubing or leave ruts above the tubing.

3.8.In order to seal NEED TO USE A WORD OTHER THAN SEAL, SINCE SEALING THE TRENCH WALL IS REFERRED TO WHEN TALKING ABOUT WET SOILS settle ????? the soil around the installed drip tubing, it is acceptable for the drive wheel of the equipment pulling the static plow or the propelled vibratory plow to roll over the insertion trench. The tires of such equipment shall not have deep traction lug or bars that would press into the trench thereby damaging the newly installed tubing. The equipment pulling a static plow shall use low ground pressure tires.

SHOULDN'T WE TALK ABOUT PLACING TUBING ON TOP OF THE GROUND UNDER A MOUND HERE AND NOT UNDER EMITTER PLACEMENT?????

Section 5.Emitter placement THIS IS NOT THE RIGHT TITLE Hydraulic Conditions

3.1.2.11 Drip tubing shall be installed no deeper than 6 inches below the natural ground surface. The drip tubing may be placed on the surface of the proposed dispersal area and a suitable layer of soil shall be used to cover the tubing. Settled depth of the cap shall not be more that 8 inches. The capping fill material shall not contain more than 27 % clay. All capping fill material shall be pre- approved by the authorized agent of the Department of Health before the fill is delivered to the proposed dispersal site. ARE WE GOING TO INSPECT THE FILL MATERIAL OFF SITE???? A credit of 4 inches will be allowed in the adjustment of the seasonal water table when capping fill material is used. This seasonal water table credit is at the soil sole discretion of the Departmentof Health. DO WE SPECIFY VEGETATION COVER

3.2.3.1The critical factors that affect the movement of the wastewater in the soil are:

3.2.1.The type and characteristics of the wastewater,
3.2.2.The soil texture and structure,
3.2.3.Vegetation, temperature,
3.2.4.Climatic conditions, and
3.2.5.Drip dosing rate and duration.

3.3.3.2An accurate soil evaluation is the first step in determining the appropriate dose rate and volume.

3.4.3.3The ideal dispersal situation is the equal distribution of the wastewater over the entire area. Dosing of the wastewater must be done carefully to reduce the potential for hydraulic overload of the dispersal field. The potential for over saturating the drip field increases as the number of dosing cycles increase. A condition known as “drain back” occurs when the laterals at the lower elevation are over saturated from water that drains from higher elevation laterals. HOW DO WE PREVENT THIS WITH FIELD LINES????

Section 5.Drain-Back THIS IS OUT OF PLACE HERE, THIS IS AN OPERATING CONDITION, NOT A SYSTEM PART

5.2.A condition known as drain-back occurs when the laterals at the lower elevation are over saturated from water that drains from higher elevation laterals. Drain-back is a gravity induced redistribution of wastewater within the dispersal field. The pre- and post-pressurization of the driplines may allow some emitters in the dispersal field to discharge more wastewater than other emitters. This condition can result in locally overloading areas of the dispersal field, general it will be the lowest driplines in a dispersal zone. A number of methods may be employed that will minimize the effects, such as the use of check valves or top loaded manifold configurations.

5.3.The success of any drip dispersal system depends on a balance between wastewater dose rates, dose volumes, as well as, soil, and site characteristics. A poor match results in either poor hydraulic performance with saturated soils and environmental, public health hazards and aesthetic problems.

WHERE DO WE TALK ABOUT TANKS????? SEPTIC, PRETREATMENT, DOSING, SETTLEMENT?????

Section 6.Wastewater Quality PRETREATMENT UNITS
Section 7.

5.1.The quality of effluent that will be applied to the dispersal field shall meet the current American National Standards Institute/National Sanitation Foundation (ANSI/NSF) Standard 40 requirements for class 1 treatment systems (WE NEED TO SITE A SPECIFIC DATE OF STANDARD DON’T WE????). Only pretreatment units that have obtained approval from the Department of Health shall be used. A pretreatment system shall be required as part of any Drip Dispersal System design.

Section 6.Pumps
Section 7.

7.1.Pumps provide the energy needed for distributing the wastewater to the dispersal field, and flushing the drip system. Two types of pumps may be used: centrifugal and submersible turbine pumps. Since drip systems require a higher head pressure thatn other types of pumping systems, submersible turbine pumps are in most cases the preferred choice. Proper pump selection depends on two factors: the maximum flow rate and the total dynamic head required by the system. Precautions in pump selection are needed to ensure that pressure limits are not exceeded by any components at any location within the system.

Section 8.Section 6. Filters and screensScreens

7.1.6.1. Drip systems shall include a filter or screen system to protect the emitters from suspended solids and other debris. Filtration is one of the most important and complex parts of designing and constructing a reliable drip system. IS THE FILTRATION DETERMINED BY THE MANUFACTURER OF THE SYSTEM There are three types of filters or screens used for wastewater applications: spin or screen filter, disk, and sand.

6.2. Solids and other debris shall be filtered to a size of 100 microns or less.

18.1.Spin or screen and disk filters are relatively small and are sized to match the maximum flow rates of the system. Regular flushing and back washing of both filters are critical to both the short- and long- term performance of these filters. Solids and other debris shall be filtered to a size of 100 microns or less. THIS STANDARD FOR SOLIDS SHOULD BE PUT SOMEWHERE OTHER THAN UNDER THE DESCRIPTION OF ONE KIND OF FILTER. IT SHOULD BE IN THE FIRST PARAGRAPGH To accomplish this, the filter mesh must be in the range of 120 to 150 microns. This filtered particle size is much smaller than the entrance to the emitters. The turbulent flow within the emitter keeps the smaller particles suspended during their passage through the emitter, minimizing the clogging potential.

6.2.Both types of filters need periodic(how often) disassembly (DO THEY EVER NEED REPLACING)and hand cleaning using a chlorine or diluted acid cleaner. The spin screen filters are designed to be self-cleaning by the use of a vortex plate located in the filter assembly. Spin screen filters or as it is commonly referred to as a "vortex filter" requires a minimum flow rate to produce a scouring action against the filter screen. The filter flush valve must be open slightly(HOW MUCH PRESSURE) to allow a small amount of water to flush solids from the filter. The filter must be placed in the wide-open position during scheduled maintenance. A disk filter has a greater surface area and depth. The amount of debris holding capacity is more than compared to spin filters, but the disk filter does have a tendency to stick together. To separate the filter disk and backwash the filter properly, a larger flow rate will be required from the pump. WHO IS GOING TO DO THIS MAINT?????

6.3.

6.4.6.3. Filter debris shall be returned to the septic tank, pretreatment unit, or a separate settling tank regardless of the type of filter system. The flush water waste needs to be properly managed since it will contain the filtered solids from the wastewater. The return of solids to the dosing tank is undesirable, since solids can be recycled back through the pump and filter assembly. The recycling of the solids from the dosing tank only adds additional load on the filter system and defeats the purpose of a filter.

The flushing cycles need to be optimized, since too many flushing cycles may overload the pretreatment system. On the other hand, too little flushing may present itself as a maintenance issue for the drip dispersal system. If the filter flush water is routed back to the dosing tank, it is advisable that the pump inlet be elevated above the bottom of the tank preferable closer to the middle of the tank. If a spin screen filters are used, the flush outlet of the filter must be at an elevation that will allow gravity flow of the flush water back to the pretreatment system. The volume of filter flush water may not be sufficient to fill the return line and move the solids. Also, clear Schedule 40 PVC piping shall be included in the field flush and filter flush line. The clear Schedule 40 PVC piping allows for direct observation of the wastewater as it flows from the filter flush line or the field flush line.

6.5. . THIS IS THE FIRST PLACE WE MENTION RETURN LINES, SHOULD IT BE INTRODUCED IN GENERAL SYSTEM DESCRIPTION

6.6. Sand filters are often used on commercial systems since this system will filter a larger volume of wastewater when compared to the other type filters. Sand filters are pre-sized to match both the effluent quality and drip system components. Compared to the other types of filters, sand filters require a large volume of water for proper back flushing.

6.7. Pressure effluent filters may be used as a pre- filter before the field filter system. These filters are very similar to the spin filter except the size of the screen holes is much larger (0.062-inch diameter). The use of a pressure effluent filter can reduce the load on the drip field filter.

1.

Section 7. Controller or control panelControl Panel

7.1 Timed dosing is the only method for controlling the dose cycles and volumes.

7.2 Control panels shall be constructed of the following basic components: NEMA 4X rated enclosure, motor-start contractors, separate circuit breakers for pump and panel control, audio and visual alarms, and wiring terminals. Optional components range from elapsed time meter or counters, event counters and pump run lights.

Section 20.

11.1Timed dosing is the only approvableed method for controlling the dose cycles and volumes. Timer control panels allow a more precise control of the both the volume and frequency of the wastewater dosing. When used with flow meters and other sensors, the control panel can provide data for evaluating the performance of the system as well as troubleshoot potential system problems.

7.3Control panels shall be constructed of the following basic components: NEMA 4X rated enclosure, motor-start contractors, separate circuit breakers for pump and panel control, audio and visual alarms, and wiring terminals. Optional components range from elapsed time meter or counters, event counters and pump run lights.

7.3

Section 9.Section 8. Flow meters and pressure gauges

8.1 A flow meter shall be installed after the filter system but before the drip dispersal field. The flow meter shall incorporate not only a rate of flow gauge but also a total gallons pumped register. The flow rate gauge and the total gallons pumped register may be separate devices. The flow meter shall be installed in a protective box that will be. The meter box shall be of sufficient size for servicing the meter and to allow easy access for reading the meter. ALSO IN THE HEADWORKS BOX????? With the Pressure Guages or SEPERATE A method shall be included in Tthe configuration of the meter hookup that will should allowallow easy removal and replacement ?reinstallation of the flow meter. The flow meter shall be sized for the dispersal flow as well as the additional field flushing volume.

8.2 Pressure gauges shall be located before the filter, after the filter and on the dispersal field return line. Pressure gauges shall be enclosed in the head works box, which allows easy access for observation. The gauges shall be liquid filled and a minimum of 3 inches in diameter. The pressure range of the gauge shall be sufficient for the maximum pressure that will be expected in the system.

9.2.Pressure gauges shall be located before the filter, after the filter and on the return line.RETURN TO WHERE?? Pressure gauges shall be enclosed in the head works box, which allows easy access for observation. The gauges shall be liquid filled and a minimum of 3 inches in diameter. The pressure range of the gauge shall be sufficient for the maximum pressure that will be expected in the system.

Section 10.Section 9. Supply line and manifold

10.1.9.1. The supply line and manifold piping provides a way to deliver filtered wastewater to the drip dispersal field. Two considerations in the design of any piping system will need to be considered: velocity and acceptable head loss. Pipes that are too large will have a velocity that is very low in the number of feet per second. Over-sizing the piping in a system is not cost effective and can result in poor flushing of the dispersal field. On the other hand, a piping system that is too small will have a very high velocity and an unacceptable head loss. This condition can cause various hydraulic problems such as water hammer. The supply line and manifold should be designed with a flow velocity between the 0.5 2 feet per and 5 feet per second.

~~10.2.~~9.2. The piping and fittings in the supply line and the manifold shall be Schedule 40. Schedule 80 fittings shall be used at the filter system, as well any point where the piping will be disconnected or subjected to abuse. ~~?????????~~

When dosing, ~~T~~the ~~layout of the~~ supply manifold shall ~~consider the~~eliminate the drain back potential ~~of drain back of the wastewater~~ from a higher ~~elevation in the drain field~~ to a lower elevation in the drain field. ~~after a dose. A drain back condition can hydraulically overload the soil around the lower drip laterals. The dispersal field can be configured into sub zones within a single zone layout. The layout may be a "top down loading" manifold or zone isolation with the use of check- valves. Other methods can be the use of soil dams or humps at the end of each run or rapidly draining the dispersal field back to the dose tank.NEED TO DESCRIBE THIS BETTER The hHydraulically isolating of a drip lateral or sub zone after a dose will prevent the drip tubing from becoming a French drain when the soil is heavily saturated from either rainfall or heavy dosing.~~

9.3.

Section 10. Return Manifold and Line

~~10.~~ The return manifold and line allow the flushing of the drip dispersal field. The flushed wastewater and solids shall be returned back to the settling tank or treatment tank

~~10.~~

~~10.The return manifold and line allow the flushing of the drip dispersal field and return the flushing wastewater and solids back to the settling tank or treatment tank. The same consideration that are used for the supply line and manifold will also be use for the return manifold and line. Flow rates are lower in the return line due to the fact the drip emitters are working, and a smaller line may be required to help maintain the self-cleanings velocityies. Field pressure will be drop in the drip field during the line flush cycle.~~

10.1.

~~Section 12.~~Section 11. Flexible hose or tubing

~~12.1.~~11.1 Flexible Schedule 40 PVC piping shall be used at all connections to the supply and return manifolds. ~~Theis piping is very flexible and durable and can be used with standard Schedule 40 PVC fittings and cement. The use of such piping minimizes the kinking of the drip tubing during construction and allows the soil to settle after construction. The flexible piping shall be the same size as the drip dispersal tubing. The flexible PVC piping shall be used when connecting two runs together.~~

Section 12. Air/vacuum relief valves

~~Section 5.~~

12.1 Air/vacuum relief valves provide a means for releasing air at the start of a dose cycle, so the system will charge quickly with wastewater and allow air to enter the system quickly at the end of dose cycle. Air/vacuum valves shall be located at the highest points of the either supply or return manifolds, or both.

12.2 Air/vacuum relief valves shall be sized based on the proposed design flow rate. A valve that is under sized will not provide an adequate amount of airflow.

12.3 A Schrader valve shall be provided at each vacuum valve as a means of checking the pressure of the drip field.

~~13.1. Air/vacuum relief valves provide a means for releasing air at the start of a dose cycle, so the system will charge quickly with wastewater and allow air to enter the system quickly at the end of dose cycle. This minimizes the opportunity for fine soil particles to be drawn into the emitters due to a vacuum on the drip line. The effectiveness of the air/vacuum release valves depends on the location of the valves. Air/vacuum valves shall be located at the highest points of the either supply or return manifolds, or both. Special care shall be taken to minimize the effects of soil siphoning in the emitters. This condition can occur where the drip line has sags or humps where the wastewater blocks the movement of air into the drip line.~~

~~13.2. Air/vacuum relief valves shall be sized based on the proposed design flow rate. A valve that is under sized will not provide an adequate amount of airflow.~~

~~13.3. A Schrader valve shall be provided at each vacuum valve as a means of checking the pressure of the drip field.~~

Section 13. Flushing valves

~~13.1 Flushing the drip field is normally accomplished by opening a flush valve located near the flush return tank or pretreatment unit. Since dosing of the drip field occurs at the same time as flushing, a sufficient volume of wastewater shall be available during this time.~~ Automatic flushing controls shall be required for all drip systems. The flush valve shall be a solenoid type valve. ~~Control panel programming will control the operation of the solenoid type valve. Solenoid valve opening and closing action can be either low voltage or hydraulic.~~ Manual flushing valves may be installed in the field flush line. ~~The manual field flush valves are needed when a high flow of water would be required.~~ Manually operated valves may be standard ball or gate valves. ~~Flush valves may be partially open to allow a small continuance continuous flush or used to control the operating pressure of the drip field.~~ The flush valve shall be fully opened during a flush cycle regardless of the valve type. The field flushing velocity shall be in accordance with the drip tubing or system manufacturer's recommendations. The minimum field flushing velocity shall not be less than 0.5 feet per second.

~~Section 14.~~

~~14.2.~~13.1 ~~Flushing can present some practical difficulties that must be addressed, since flushing requires a large amount of wastewater. The flushing cycles shall be planned and scheduled when the required wastewater volume for flushing is available. The extra flushing loads should not upset or over load the pretreatment system.~~

~~Section 15.~~Section 14. Pipe and specialty connectors and fittings standards

~~15.1.~~14.1. PVC pipe, tubing, reducer tees, adapters, elbows, couplers and compression fittings shall be constructed of Schedule 40 PVC.

~~15.2.~~14.2. Lock-Slip fittings, adapters, tees, elbows, and couplings shall be specifically manufactured for use with wastewater drip dispersal systems.

~~15.3.~~14.3. Insert fittings, barbed adapters, tees, elbows, and couplings shall be specifically manufactured and sized for use with wastewater drip dispersal systems.

~~Section 16.~~Section 15. ~~Valve/service~~ Headworks boxes

15.1. Any component or assembly that may need to be routinely serviced shall be located in a ~~valve/service~~headworks box that is readily accessible.

15.2. ~~Valve~~ Headwork boxes may be constructed of high-density PE~~,~~ (polyethylene), fiberglass, PVC, or concrete.

~~15.1.~~15.3. ~~The valve/service~~Headwork boxes shall be large enough to allow ease of service and allow periodic removal and replacement of components as needed. The ~~service~~ headworks box shall be of sufficient length and depth to accommodate the various components that will be housed in the box. The lid of the ~~service~~ headworks box shall extend above the finished grade. The bottom of the ~~service~~ headworks box shall be designed to drain any rainwater or wastewater away from the inside of the box. The ~~service~~ headworks box lid shall be easy to remove but also shall be made tamperproof where access to the site is not restricted or controlled. The structural strength of the ~~service~~ headworks box and lid shall be sufficient to withstand the weight of any lawn maintenance equipment or other service equipment that may roll over the box. If the box will be subject to excessive wheel loading, additional protection shall be provided.

Section 16.Zones and related components
Section 17.Section 16.

16.1.Drip dispersal systems with more than one zone require additional components as needed. These components may include manual or automated zoning valves, check valves, or pressure regulators.

16.2.Zone valves allow dosing of a zone independently or separately. Two basic types of zoning valves are used: an individual electrical solenoid pilot valve or a hydraulic relay controlled by a remote solenoid pilot valve. Valves shall be selected based on design flow rates and acceptable friction loss. An important design consideration is the location of the valves. In most cases the valves are located at each zone instead of being located in a control box or building.

16.3.Another option to the use of individual solenoid valves areis automatic distributing valves. Commonly referred to as a "ratchet" valve, this type of valve can distribute wastewater into as many as up to six zones. This valve can help simplify the installation of a drip dispersal field but difficulties in troubleshooting a system failure have been noted with this valve. The valves are operated hydraulically and consist of only a few moving parts, requires no electricity and alternates automatically at the end of each cycle. An automatic distributing valve requires a minimum amount of flow for proper zone cycling. A minimum flow of 10 gallons per minute is required for the valve to cycle between each zone. Backpressure can interfere with the operation of the valve, for this reason the distributing valve shall be located at a higher elevation than the drip dispersal field. A backpressure in excess of 2 feet of head can interfere with the operation of the valve mechanism causing the valve not to rotate. A pressure relief hole or a special separate drain line may be installed to relieve excessive backpressure. Automatic distributing valves shall include clear Schedule 40 piping on the output of each zone. The clear piping provides a method for identifying which zone is being dosed.

16.1. Automatic distributing valves shall include clear Schedule 40 piping on the output of each zone.

16.4. The design of multi- zones systems may require the use of a check valves if the zones are recombined in to a single return line. Check valves hydraulically isolate each zone and prevent wastewater from reentering zones, which are not in use for dosing or flushingmay not be scheduled for dosing or flushing. Check valves may shall not be required if separate return lines are used to isolate returned the wastewater to the pretreatment system. It is recommended that each check valves be installed with an isolation valves (ball valves) so that a zone with a malfunctioning check valves can be shut down for repair or replacement. Bronze swing-check valves are the most reliable type of check valve.

16.5.16.2.

Section 17.Pressure regulators
Section 17.

18.1.17.1. Pressure regulators are used to control the pressure in a single or multi-zone drip dispersal field from excessive pressure fluctuation from the pumping system. Pressure regulators are used whenever the design or the site conditions result in dispersal field pressures that exceed the recommended or design limits for the drip tubing or fittings. Regulators shall be selected to allow sufficient pressure and flows for zone flushing. Pressure regulators shall be designed for use in wastewater drip dispersal systems.

Section 19.Section 18. System installation

18.1. Protect the site prior to and after the installation of the drip system. Activities on the site shall be limited only to what is necessary for the installation of the system.

18.2. Any clearing or grubbing shall be performed based on a site-specific plan, which minimizes the disturbance of the soil and protects the overall soil characteristics. It may be necessary to use flexible PVC tubing to work around or over objects in the dispersal field; however the number of emitters shall not be reduced

18.3. Drip tubing shall not be installed when the soil is wet or frozen.

18.4. Drip tubing shall be installed on contour.

18.5. Flexible Schedule 40 PVC tubing shall be used at each manifold connection to provide additional crimping protection and to prevent the tubing from being pulled out of the supply or return manifold as the soil settles.

18.6. Drip tubing shall be taped, or plugged or capped when cut. All piping shall be taped or capped at the end of the construction day

18.7. PVC pipe cutters that cleanly shear the pipe or tubing shall be used rather than sawing the pipe or tubing.

18.8. Complete flushing of the supply line prior to the connection of the drip tubing shall be performed. Sufficient volume of water shall be used to ensure all debris is removed for both the supply line and the drip tubing.

18.9. A start-up system check shall be performed before the system is placed in operation. All operational functions that would be expected during routine operations shall be performed in a specified time period of not less than 24 hours. This operational test shall include but not be limited too: timed dose functions, volume loading, flow rates, pressures at the inlet and outlet of each zone, pressures at the inlet and outlet of filters, leak detection, flushing, and alarms.

18.10. Repairs or modifications shall be made to eliminate any wet spot.

18.11. The establishment of a vegetative cover is critical to the overall performance a drip dispersal system. The dispersal area shall be covered with sod or mulch as soon as possible after the installation of the drip tubing.

11.20.1. Several important aspects to installing a drip system, which is critical for long-term success of the system, are:

11.20.1.1. The best-designed system may not perform as designed if the installation is poor. Quality workmanship is more important than experience. It is recommended that the system designer be on site during the installation to ensure that the system is installed and all components meet design specification.

11.20.1.2.

19.1.2. Protect the site prior to and after the installation of the drip system. Activities on the site shall be limited only to what is necessary for the installation of the system.

19.1.3. Any clearing or grubbing shall be performed based on a site-specific plan, which minimizes the disturbance of the soil and protects the overall soil characteristics. A site may be harmed if heavy equipment is used to cut and remove trees, or push over root balls. The preferred method for clearing woods from a dispersal site is to cCut trees flush with the ground and remove with tracked equipment. is the preferred method for clearing woods from a dispersal site. It may be necessary to use flexible PVC tubing to work around or over objects in the dispersal field WHAT DOES THIS MEAN

11.20.1.3. Never install drip tubing when the soil is wet or frozen. WHAT IS WET???? DAMP, UNDER STANDING WATER, DEW, SPrinkled

11.20.1.4.

11.20.1.5. Install the drip tubing on contour, minimizing sags and humps that would prevent the drip tubing from draining properly. Off contour installations may contribute to premature clogging of emitters caused by a vacuum in the drip line.

11.20.1.6. Avoid crimping the drip tubing at any location in the dispersal field. Careful attention shall be made at or near the connections of the drip tubing to the supply and return pipes.

11.20.1.7. Flexible Schedule 40 PVC tubing shall be used at each manifold connection to provide additional crimping protection and to prevent the tubing from being pulled out of the supply or return manifold as the soil settles.

11.20.1.8.

19.1.8.Drip tubing shall be taped or plugged capped???? when cut. It is very important during installation that dirt and construction debris be minimized from entering the tubing. All piping shall be taped or capped at the end of the construction day.

19.1.9.PVC pipe cutters that cleanly shear the pipe or tubing shall be used rather than sawing the pipe or tubing. Potential problems exist from the PVC shavings and chips clogging or damaging the drip emitters.

11.20.1.9.A complete flushing of the supply line prior to the connection of the drip tubing shall be performed. A sufficient volume of water shall be used to ensure all debris is removed for both the supply line and the drip tubing. It is a good practice to remove the vacuum release valves prior to flushing to not only keep debris out of the valves but also allow the system to operate at low pressure.

19.1.11.A start-up system check shall be performed before the system is placed in operation. All operational functions that would be expected during routine operations shall be performed in a specified time period of not less than 24 hours. This operational test is necessary to ensure the system is performing as designed. This operational test shall include but not be limited too;: timed dose functions, volume loading pumped, flow rates, pressures at the inlet and outlet of each zone, pressures at the inlet and outlet of filters, leak detection, flushing, and alarms. WHAT ABOUT RETURN TESTING

19.1.12.Wet spots in the dispersal field as well as the supply and return manifold shall be investigated. Wet spots may be cause by faulty connectors, faulty emitters, inadequate soil cover or a cut in the drip tubing. Repairs or modifications shall be made to eliminate any wet spot.

19.1.13.The establishment of a vegetative cover is critical to the overall performance a drip dispersal system. The dispersal area shall be covered with sod or mulch as soon as possible after the installation of the drip tubing.

Section 20.Section 19. System operation Operation and maintenanceMaintenance

19.1. Periodic servicing shall be required. The frequency of the service period is dependent on the operational parameters set for the system by its designer. The minimal service period shall not be less than once every three (3) months.

19.2. Alarms resulting from mechanical breakdowns shall be investigated and the situation causing the alarm resolved.

19.3. Owners of Drip Dispersal Systems are required to maintain a Maintenance and Monitoring Contract with Maintenance Personnel certified by the Department for the life of the system.

20.1.Operation and maintenance is a critical component to the success of this system. WHY IS ABSOLUTELY EVERYTHING CRITICAL TO THE SUCCESS OF THE SYSTEM????? Drip systems are a sophisticated mechanical system that is dependent on the proper operations of pumps, timers, filters, valves and alarms. Drip system will not function properly unless a long-term commitment to Operation and Maintenance is established.

20.2.Periodic servicing is required. The frequency of the service period is dependent on the operational parameters set for the system by its designer. The minimal service period shall not be more than once every three (3) months. Under unusual operational circumstances, the required maintenance period may be a timeframe of less than once every three (3) months.

20.3.Alarms resulting from mechanical breakdowns shall be investigated and the situation causing the alarm resolved.

Section 21.Site assessment

21.1.Subsurface Drip System(s) may be utilized on sites that meet the following criteria

21.1.1.The minimum vertical separation between the drip tubing or installed trench bottom and any rock substrata (consolidated or fractured) shall be nine (9) inches or greater of undisturbed, natural soil.

21.1.2.The drip tubing or installed trench bottom shall be above the seasonal water table, whatever the duration. Brief seasonal water tables may be minimized or eliminated by the use of effective interceptor drains. Any design, which incorporates the use of an interceptor drain, shall indicate the effective depth of seasonal water table reduction.

21.1.3.The percent clay of a soil shall be interpreted as a Seasonal Water Table Class. Information on clay percentage as it relates to seasonal water table interpretation can be found in documents from the Onsite Wastewater's Soil Morphology Program. Don't they need to be listed here since we say early on that the drip system falls outside of the Onsite Wastewater…..

21.1.4.Soils that are structurelessstructure less or with massive structure shall not be approved for onsite sub-surface treatment.

21.1.5.The lot size shall be of sufficient area to accommodate both the primary and secondary dispersal area. Both the primary and secondary dispersal area shall be sized according to their respective loading rates. If the lot can only support the primary dispersal field, a subsurface drip dispersal system shall not be installed. For lots three (3) acres or greater, the use of a surface discharge drip system may be considered. (See Surface Discharge Systems)

21.2.Seasonal Water Table depth shall be determined according to the Agency's document "*Seasonal Water Table Classes*". Soils with Chert parent material that exhibit higher clay content may merit additional investigation.

Section 22.Loading RatesSystem Design

Section 20.

20.1.Drip Dispersal fields are a "bed" design and the use of four (4) to six (6) inch installation depth does not fit conventional trench system design. WHY IS THIS HERE

A maximum loading rate of ?????? gallons per square foot per day shall be utilized. DOES THIS NEED TO BE HERE????

22.2.20.1. The following procedure shall be used to determine the minimum surface area required for drip dispersal systems.

22.2.1.20.2. The depth and duration of the seasonal water table shall be determined

20.3. The sizing or loading rate chart found in Table I of this manual shall be used to determine the amount of surface area required for installation.

20.4 The spacing between drip tube laterals shall not be less than two (2) ft. center to center. Drip tube laterals spacing may be greater than two (2) ft. however, for the purpose of determining the length of tubing required for a dispersal field, all length calculation shall be two (2) ft. center to center.

20.5 The effective area of the dispersal field shall be calculated by dividing the daily wastewater flow rate (DWF) in gallons per day (gpd) by the soil loading rate (SLR) in gallons per foot square per day (g/ft ft^2/d). [Area of the dispersal field (DF) = design wastewater flow (DWF) ÷ soil loading rate (SLR).]

20.6 The length of the drip tubing shall be determined by dividing the dispersal field (DF) required by the drip tube spacing (DT) of two (2) Ft. [Drip tube length (DTL = dispersal field area (DF) ÷ drip tube spacing (DT) of two (2) ft]

20.7 The number of emitters required shall be determined by dividing the drip tube length (DTL) by the emitter spacing (E) ft. [Drip line lateral length (ft.) ÷ emitter spacing (ft) = Number of emitters]

20.8 The loading rate for a soil which has a rock substrata (consolidated or fractured) and no seasonal water tables present above the rock substrata shall be sized as a moderate seasonal water table.

~~Section 21.~~ ~~The sizing or loading rate chart found in appendix of this manual shall be used to determine the amount of surface area required for installation~~

~~23.~~Section 21. Training and Certification

~~23.1.~~21.1. All Designated Representatives, Installers, Environmental Health Specialists, and Certified Maintenance Personnel shall be certified in the design, construction and maintenance of a drip dispersal system. The certification program will be provided or approved by the Department ~~of Health~~, Onsite Wastewater Section.

~~Section 24.~~Section 22. Surface Discharge Drip System

~~24.1.~~22.1. Under certain conditions, Drip Dispersal Systems may be approved as a surface discharging system.

~~24.2.~~22.2. The requirements for surface discharge are:

~~24.2.1.~~22.2.1. The ~~soil~~ site is unsuited for a subsurface drip dispersal system.

~~24.2.2.~~22.2.2. Pre-treatment shall be a C~~c~~lass ~~1~~1 treatment unit as approved by the Department. (See Section 5 Pretreatment Requirements)

~~24.2.3.~~22.2.3. Lot size shall not be less than three (3) acres. The lot size shall not include road or highway right of ways or utility easements.

~~24.2.4.~~22.2.4. A one hundred (100) foot setback from any property lines shall be maintained in all directions from the drip dispersal field.

~~24.2.5.~~22.2.5. A maximum loading rate of 0.09 gallons per square foot per day shall be utilized.

~~24.2.6.~~22.2.6. Ultraviolet light disinfection units shall be used as the primary method of disinfection. Ultraviolet light (UV) units shall be ~~sized to handle not only the wastewater that will be dispersed by the drip tubing but to also processas well as any and all wastewater that will be flushed back to the treatment unit.~~ approved by the Department. UV units shall be installed and maintained in accordance with manufacturers recommend practices.

Section 23. Variances and Exemptions

23.1. Requested variations from these Rules and Regulations will be considered and may be approved at the sole discretion of the Department.

23.2. Submission of proposed experimental onsite wastewater systems may be approved, disapproved, or approved on a trial basis for a specific period of time. Such approval or disapproval shall be at the sole discretion of the Department. Submission of an experimental design shall include data as to the efficiency of operation of the proposed experimental system. A monitoring plan shall be submitted for approval in addition to the system design.

23.3. Good management practices. Good management practices are additions or modifications to systems which will make such systems more efficient, or which could make such systems acceptable in certain soil conditions. Where good management practices are proposed for inclusion in a drip dispersal system, approval shall be at the sole discretion of the Department or its Authorized Agent.

Section 24. Fees

24.1. A fee shall be levied for the review of individual drip dispersal system permit application pursuant to A.C.A § 14-236-116.

24.2. For structures one thousand five hundred square feet 32 (1,500 sq. ft.) or less, the fee to review a permit application is thirty dollars ($30.00).

24.3. For structures more than one thousand five hundred square feet (1,500 sq. ft.) and less than two thousand square feet (2,000 sq. ft.), the fee to review a permit application is forty-five dollars ($45.00).

24.4. For structures more than two thousand square feet (2,000 sq. ft.) and less than three thousand square feet (3,000 sq. ft.), the fee to review a permit application is ninety dollars ($90.00).

24.5. For structures more than three thousand square feet (3,000 sq. ft.) and less than four thousand square feet (4,000 sq. ft.), the fee to review a permit application is one hundred twenty dollars ($120).

24.6. For structures four thousand square feet (4,000 sq. ft.) and greater, the fee to review a permit application is one hundred fifty dollars ($150).

24.7. For the alteration, repair, or extension of any individual drip dispersal system, the fee to review a permit application is thirty dollars ($30.00).

24.8. In calculating the square footage of a residential structure for purposes of determining the applicable fee under this section, the square footage of all auxiliary areas of the residential structure shall not be considered.

24.9. Auxiliary areas include garages, carports, porches, and other similar areas as determined by the Department.

24.10. Non-individual or multi structure permit submittals shall include a *Cost Estimate Worksheet (EHP-17).*

Section 25. Penalties

25.1. Any person, firm, corporation or association who violates any of the provisions of Act 402 of 1977, as amended, or any Rules and Regulations promulgated under the authority of Act 402 of 1977, as Amended, shall upon conviction, be deemed guilty of a misdemeanor and shall be punished by a fine of not less than one hundred dollars ($100.00) nor more than one thousand dollars ($1,000.00).

Section 26. Severability

25.2. If any provisions of these Rules and Regulations, or the application thereof to any person is held invalid, such invalidity shall not affect other provisions or applications of these Rules and Regulations which can effect without the invalid provisions of application, and to this end the provisions hereto are declared to be severable.

Section 27. Repeal

27.1. All Regulations and parts of Regulations in conflict herewith are hereby repealed.

Section 28. Certification

This will certify that the foregoing Rules and Regulations Pertaining to Onsite Wastewater Systems, Designated Representatives and Installers were adopted by the Arkansas Board of Health at a regular executive session of said Board held in Little Rock, Arkansas, on the ?th day of ?, ?.

Paul K. Halverson, DrPH, Director
Arkansas Division of Health

Dated at Little Rock, Arkansas, this ? day of ?, 200?

The foregoing Rules and Regulations, copy having been filed in my office, are hereby approved this ? day of ?, 200?.

Mike Beebe
Governor

~~Appendix~~ Table I

DRIP DISPERSAL FIELD SIZE AND SOIL LOADING RATES

	Brief SWT		Mod SWT		Long SWT	
DEPTH TO RMF	(g/ft²/d)	FT²/100 Gal./Day	(g/ft²/d)	FT²/100 Gal./Day	(g/ft²/d)	FT²/100 Gal./Day
1	0.021	4878.05	0.007	14634.1	0.003	29268.3
2	0.041	2439.02	0.014	7317.07	0.007	14634.1
3	0.062	1626.02	0.021	4878.05	0.010	9756.1
4	0.082	1219.51	0.027	3658.54	0.014	7317.07
5	0.103	975.61	0.034	2926.83	0.017	5853.66
6	0.123	813.008	0.041	2439.02	0.021	4878.05
7	0.144	696.864	0.048	2090.59	0.024	4181.18
8	0.164	609.756	0.055	1829.27	0.027	3658.54
9	0.185	542.005	0.062	1626.02	0.031	3252.03
10	0.205	487.805	0.068	1463.41	0.034	2926.83
11	0.226	443.459	0.075	1330.38	0.038	2660.75
12	0.246	406.504	0.082	1219.51	0.041	2439.02
13	0.267	375.235	0.089	1125.7	0.044	2251.41
14	0.287	348.432	0.096	1045.3	0.048	2090.59
15	0.308	325.203	0.103	975.61	0.051	1951.22
16	0.328	304.878	0.109	914.634	0.055	1829.27
17	0.349	286.944	0.116	860.832	0.058	1721.66
18	0.369	271.003	0.123	813.008	0.062	1626.02
19	0.390	256.739	0.130	770.218	0.065	1540.44
20	0.410	243.902	0.137	731.707	0.068	1463.41
21	0.431	232.288	0.144	696.864	0.072	1393.73
22	0.451	221.729	0.150	665.188	0.075	1330.38
23	0.472	212.089	0.157	636.267	0.079	1272.53
24	0.492	203.252	0.164	609.756	0.082	1219.51
25	0.513	195.122	0.171	585.366	0.085	1170.73
26	0.533	187.617	0.178	562.852	0.089	1125.7
27	0.554	180.668	0.185	542.005	0.092	1084.01
28	0.574	174.216	0.191	522.648	0.096	1045.3
29	0.595	168.209	0.198	504.626	0.099	1009.25

	Brief SWT		Mod SWT		Long SWT	
DEPTH TO RMF	**(g/ft²/d)**	**FT²/100 Gal./Day**	**(g/ft²/d)**	**FT²/100 Gal./Day**	**(g/ft²/d)**	**FT²/100 Gal./Day**
30	0.615	162.602	0.205	487.805	0.103	975.61
31	0.636	157.356	0.212	472.069	0.106	944.138
32	0.656	152.439	0.219	457.317	0.109	914.634
33	0.677	147.82	0.226	443.459	0.113	886.918
34	0.697	143.472	0.232	430.416	0.116	860.832
35	0.718	139.373	0.239	418.118	0.120	836.237
36	0.738	135.501	0.246	406.504	0.123	813.008
37	0.759	131.839	0.253	395.517	0.126	791.035
38	0.779	128.37	0.260	385.109	0.130	770.218
39	0.800	125.078	0.267	375.235	0.133	750.469
40	0.820	121.951	0.273	365.854	0.137	731.707
41	0.841	118.977	0.280	356.93	0.140	713.861
42	0.861	116.144	0.287	348.432	0.144	696.864
43	0.882	113.443	0.294	340.329	0.147	680.658
44	0.902	110.865	0.301	332.594	0.150	665.188
45	0.935	106.952	0.308	325.203	0.154	650.407
46	0.943	106.045	0.314	318.134	0.157	636.267
47	0.964	103.788	0.321	311.365	0.161	622.73
48	0.984	101.626	0.328	304.878	0.164	609.756

APPENDIX II

GLOSSARY AND ACRONYMS

The following terms are used in or are relevant to this document. The definition or meaning for most of the termsare based on existing industry sources has been copied or adapted from existing sources. Common words are not defined.

Appendix A

QUANTITIES OF WASTEWATER FLOW FOR VARIOUS TYPES OF ESTABLISHMENTS

ESTABLISHMENT TYPE	GALLONS PER DAY
Airports, bus terminals, train stations Per passenger Add per employee per 8 hour shift	 5 20
Barber & beauty shops per chair	100
Bowling alleys Toilet wastes per lane For food service, add restaurant usage below	 100

Camps Campground with central comfort stations per camper Day camps (no meals served) per camper Per non resident camper Per resident camper or employee Churches Per seat/no food service For food service, add restaurant usage below For daycares, add school usage below Commercial establishments excluding deli, bakery, or meat department Per 100 square feet of floor space Add per 100 square feet of deli floor space Add per 100 square feet of bakery floor space Add per 100 square feet of meat market floor space	 35 15 50 75 5 10 50 50 100
Country clubs Per resident member Per non-resident member present	 100 25
Dentists offices Per wet service chair Add per non wet service chair	 200 50
Doctors office Per practitioner Add per employee per 8 hour shift	 250 20
Factories, exclusive of industrial waste Gallons per employee per 8 hour shift No showers provided Showers provided	 20 35
Hospitals Per bed space For food service excluding patients, add restaurant usage below	 200
Hotels & Motels Regular per room Resort hotels & cottages Add for establishments with self service laundry facility per machine	 150 75 750
Institutions per meal served per day	65
 Mobile home parks per single wide mobile home space per double wide mobile home space	 300 450
Nursing homes, rest homes, adult congregate living facilities Per bed Add for food service (see Institutions, this chart)	 100
Office buildings per employee per 8 hour shift	15
Parks, public picnic Toilets only per person With bath house, showers, & toilets per person	 5 10

Recreation vehicle park Recreational vehicle space for overnight stay, without water & sewer hookup per vehicle space Recreational vehicle space for overnight stay, With water & without sewer hookup per vehicle space Recreational vehicle space for overnight stay, with water & sewer hookup per vehicle space	 75 100 150
Restaurants Per day per seat per meal setting Using single service articles only per seat Bar and cocktail lounge per seat Carry out only Per meal served without public restrooms Per meal served with public restrooms Add per employee per 8 hour shift	 30 25 30 5 10 15
Residences Single or multiple family per dwelling unit 1 bedroom 2 bedroom 3 bedroom 4 bedroom For each additional bedroom add Rooming houses per occupant space	 150 270 370 450 50 75
Schools per student Day schools & day cares Add for showers Add for food service Add for day school workers Boarding schools	 15 10 5 20 75
Service stations & convenience stores Per vehicle served Food service, per meal served	 10 5
Stadiums, race tracks, ball parks per seat	5
Swimming pools and bathhouses per patron	10
Theaters Indoor, movies/auditorium per seat Outdoor, drive-ins per space	 5 10
Veterinary clinic Per practitioner Add per employee per 8 hour shift Add per kennel, stall, or cage	 250 20 20

FOOTNOTES:

The estimated flows for residential systems assume a maximum occupancy of 2 persons per bedroom. Where residential care facilities (non-institutional) will house more than 2 persons in any bedroom, estimated flows are to be increased by 75 gallons per each additional occupant.

Waste from food service operations is commercial in nature and may require special system sizing and treatment/disposal considerations. For food service operations, kitchen wastewater flows are normally to be calculated at 66% of the total wastewater flow. Estimated daily flow is based on 3 meals served per seat per meal setting.

Systems serving high volume establishments, such as fast food restaurants, convenience stores, and service stations require special sizing consideration due to above average wastewater volume expected from restroom facilities.